

Device for Instantly Pre-Heating Dies

Background of the Invention

Conventionally, when using method of injection processing applied in dies or molds, in order to let the melted plastic filled inside the dies and flow smoothly, and to prevent the melted plastic being cooled too early, a first die and a second die have to be pre-heated to a certain temperature before combining the two dies for injection. This can prevent the melted plastic being cooled too prematurely and can flow smoothly before forming process.

Conventionally, injection-molding uses fixed type heating method inside a first and a second die, high cycle wave heating techniques is applied. As shown Fig. 1, which is an invention “Instantly Pre-Heating Mold Structure for First and Second Dies” with Publication No. 463718. It uses a first and a second die, while the first die having a die contact part, a heating system and a cooling system by its side. The second die having a die contact part and a filling hole by its side. A first and a second die surfaces are disposed on the heating and cooling system respectively. The first die surface is corresponding to a ceramic or cement epoxy enclosed high cycle wave induction heating coil system, which is a little bigger than a die contact part groove, and is disposed at the back of the die contact part. Firstly, let the first die surface pre-heated, then combine the first and the second die surfaces inside the second die, injection forming is completed speedily and will detach from the dies after being cooled down by a piping system of the cooling

system inside the second die surface. The first die surface having a small area for speedy pre-heating and the second die surface provides a simultaneous cooling effect for injection. Regardless of using either electrical heating or high cycle wave heating method, the heat must be distributed throughout the whole die in order to let the melted plastic flow smoothly into the die hole for forming. Therefore, the drawback of this conventional type of pre-heating device disposed inside the dies is that, the time needed for pre-heating is long, especially the time needed for pre-heating the die contact part. Secondly, pre-heating temperature often cannot reach an ideal level in the die contact part, causes the melted plastic unable to flow smoothly to inside the dies hole for forming and thus increase the percentage of defective products. Thirdly, even the melted plastic can flow smoothly inside the dies, the time needed for cooling is often too long and will affect the cooling effect for forming. Therefore, it is a priority to improve the pre-heating and cooling process effectiveness and shorten the time.

As shown in Fig. 2, which is an outer type dies pre-heating device. It mainly comprises a gas burner head, a fuel pipe, a supportive frame and a regulator valve. The gas burner head is formed on an upper and a lower parts of the dies pre-heating device, concave airing spaces are disposed on the upper and the lower parts of the dies pre-heating device. The gas burner head with evenly arranged holes is disposed on the inner ring of the concave airing spaces. The fuel pipe with its one end is screwed on the gas burner head, and another end is connected to a fuel

tank to form a circulation body. The supportive frame with its one end is disposed on the middle part of the fuel pipe, and another end is disposed on a forging or injection-forming machine. The regulator valve is connected on an ideal location of the fuel pipe in order to open or close the passage from the fuel tank, and to adjust the fuel volume. So that the temperature can be pre-heated to a desired working temperature from room temperature for the processes of forge-molding and injection-molding of an upper and a lower dies of the forging or injection-molding machine. This conventional type can achieve the pre-heating effectiveness but is only suitable for large-sized forging or injection dies. Besides, it is not suitable for dies of precision parts.

Summary of the Invention

The present invention of a device for instantly pre-heating dies can pre-heat the die contact part speedily and properly, while the cooling speed is also enhanced. Thus effectiveness of injection forming is enhanced and defective percentage is reduced.

The present invention mainly comprises a first die and a second die, and a high cycle wave inductive heating coil, which is a coil body in spiral shape with its one end fixed on a mechanical arm for pre-set displacement. A die contact part is disposed on the first and the second dies respectively, and inlet holes are disposed inside the die contact parts. During injection-forming process, after the first and the second dies are separated, the high cycle wave inductive heating coil is disposed

near and between a first and a second die surfaces. So that the high cycle wave induction heating can take effect on the die contact parts and achieve pre-heating purpose. Therefore not only the pre-heating efficiency is enhanced, electricity is saved and at the same time, can ensure the melted plastic flow smoothly inside the die contact parts.

The present invention will become more fully understood by reference to the following detailed description thereof when read in conjunction with the attached drawings.

10 **Brief Description of the Drawings**

Fig. 1 is a sectional view of a conventional pre-heating device;

Fig. 2 is a perspective exploded view of a conventional pre-heating device;

15 Fig. 3 is a perspective exploded view of the present invention of a device for instantly pre-heating dies;

Fig. 4 is a sectional assembly view of the present invention of a device for instantly pre-heating dies;

20 Fig. 5 is a perspective exploded view of a second embodiment of the present invention of a device for instantly pre-heating dies;

Fig. 6 is a sectional assembly view of the second embodiment of the present invention of a device for instantly pre-heating dies;

25 Fig. 7 is a sectional assembly view of a third embodiment of the present invention of a device for instantly pre-heating dies.

Detailed Description of the Preferred Embodiment

Referring to Figs. 3 and 4, the present invention of a device for instantly pre-heating dies mainly comprises a die (1), which is formed by a separated first die (10) and a second die (20), an inductive heating coil (30) is moved and disposed between a die surface (11) and another die surface (21) of the first and the second dies respectively. The inductive heating coil (30) can induct high cycle wave magnetism to let a die contact part (40) disposed on the die surfaces (11) and (12) be pre-heated to a desired temperature. Thus can enhance the injection forming efficiency and decrease the defective percentage.

As mentioned above, the die contact part (40) is disposed on the die surfaces (11) and (21) of the first and the second dies (10) and (20) respectively, each die contact part (40) having a die hole (41) and a flow passage (42), cooling passages (12) and (24) are disposed on the first and the second dies (10) and (20) respectively near the die contact parts (40), an inlet hole (22) is disposed inside the second die (20).

The inductive heating coil (30) is a coil body in spiral shape for transmitting high cycle wave induction magnetism. Its one end is fixed on a mechanical arm (50). The first and the second dies (10) and (20) are separated. A plurality of ceramic rings (31) is disposed on each circle of the spiral-shape inductive heating coil (30), so as to prevent improper contact with the first and the second dies (10) and (20) to conduct electricity.

When the first and the second dies (10) and (20) are separated, the inductive heating coil (30) is moved between the

die surfaces (11) and (21) by the mechanical arm (50), so that its high cycle wave magnetism can take effect directly on the die contact part (40) for being instantly pre-heated. Thus can enhance the pre-heating efficiency, save electricity and ensure the melted plastic can flow smoothly inside the die contact part (40).

The inductive heating coil (30) can be a flat piece or in spiral shape, in corresponding to the surface area and shape of the die contact part (40). As shown in Figs. 5 and 6, the inductive heating coil (30') is made in corresponding to the shape of the die contact part hole (41) of the die contact part (40). A coil part (60) of the inductive heating coil (30') can be either in serial or parallel arrangement in corresponding to the die contact part hole (41). When the inductive heating coil (30') is moved between the die surfaces (11) and (21) of the first and the second dies (10) and (20) respectively, the coil part (60) can fitly disposed inside the die contact part hole (41), and the inductive heating coil (30') can jog slightly to four directions to make the die contact part hole (41) be pre-heated more efficiently.

As shown in Fig. 7, the present invention can not only applied in dual-board type die, but also can be used in triple-boards die. Besides the first and the second dies (10) and (20), a sub-die (23) is disposed on the second die (20). The inductive heating coil (30) having two sets, the inductive heating coils (30) are moved by the mechanical arms (50) respectively, so that one inductive heating coil (30) is disposed

between the first die (10) and the sub-die (23), while another inductive heating coil (30) is disposed between the second die (20) and the sub-die (23). There is something worth mentioned in this embodiment, a magnetism insulation layer (231) is
5 disposed inside the sub-die (23), in order to prevent magnetism inducted by the two inductive heating coils (30) to repel or attract each other, and causes the mechanical arms (50) to move improperly.

Accordingly, the present invention can pre-heat speedily in
10 a stable and even distribution manner, and meanwhile can also save electricity, the cooling effectiveness can be enhanced at the same time. Moreover, the present invention emphasizes on the die contact part (40) to make it be pre-heated instantly. As for the first and the second dies (10) and (20), their required
15 pre-heating temperature can be obtained from the injection forming machine, or having a device disposed inside the first and the second dies (10) and (20) to reach a required pre-heating temperature.

Note that the specification relating to the above
20 embodiment should be construed as exemplary rather than as limitative of the present invention, with many variations and modifications being readily attainable by a person of average skill in the art without departing from the spirit or scope thereof as defined by the appended claims and their legal equivalents.

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